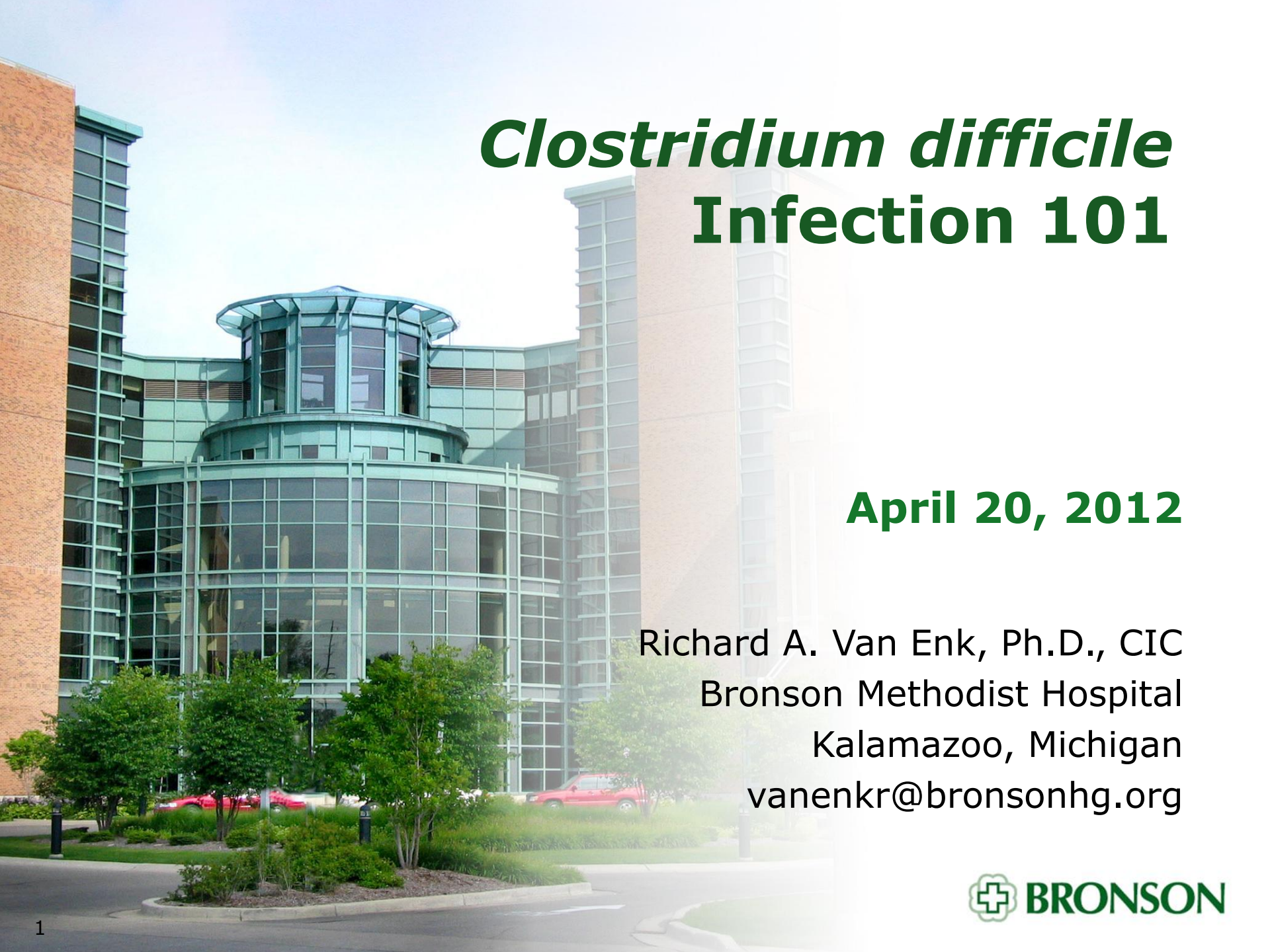

Clostridium difficile Infection 101

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Disclaimers

- Dr. Van Enk has no conflicts of interest or relationships to disclose regarding any product that may be discussed in this presentation

Outline

- Microbiology
- Pathogenesis
- Epidemiology
- Diagnostic tests
- Preventing transmission
  - Environmental cleaning
  - Hand hygiene
  - Special precautions
- CDC prevention strategies

C. difficile microbiology

- *Clostridium difficile* are Gram positive anaerobic, spore-forming rods
- Will survive in the human intestine, but not a major component
- Normal GI tract flora inhibit and out-compete *C. difficile*

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C. difficile microbiology

- Vegetative cells grow and produce toxin in the gut, endospores form on exposure to air, allow it to stay alive until it is ingested again
- Can be found in soil, water, animals, and meat; the reservoir is not clear

Figure 1. ***C. difficile*** **bacterium forming an endospore**

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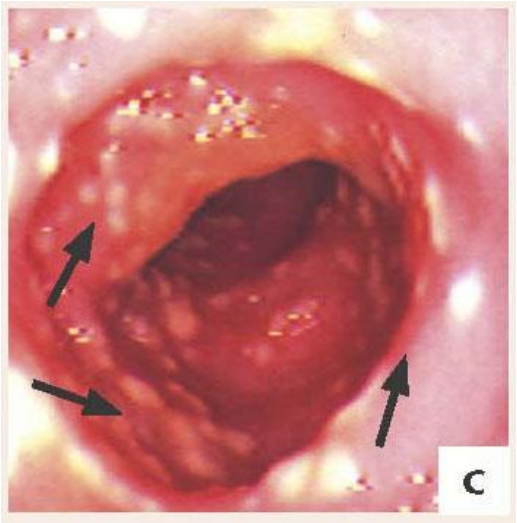
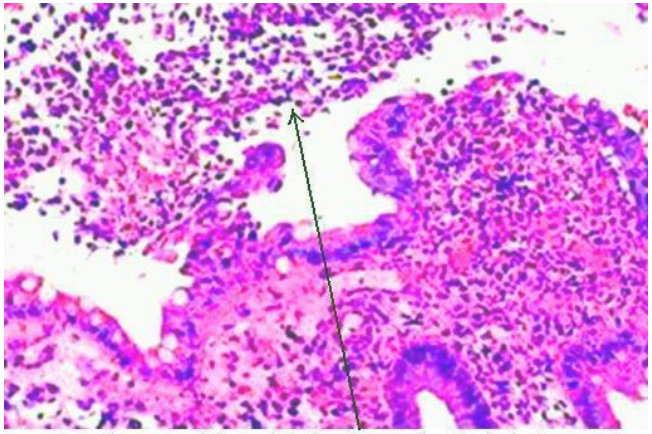
C. difficile pathogenesis

- Vegetative cells in the intestine make two powerful protein toxins, called A and B
  - Both toxins kill intestinal mucosa cells
  - A third toxin called binary toxin produces a hypervirulent strain called NAP2 that causes more severe disease
- Causes a spectrum of disease, depending on the strain, the amount of toxin, and the susceptibility of the host
  - Asymptomatic carriage, mild diarrhea, colitis, pseudomembranous colitis, toxic megacolon

C. difficile pathogenesis

- Pseudomembrane is a plaque of fibrin, inflammatory cells, dead epithelial cells
- Toxic megacolon occurs when the colon architecture breaks down, gut dies, and patient becomes septic





Pseudomembranous colitis: Early lesion characterised by luminal spray of mucus with neutrophils and nuclear debris having a vertical linear orientation.

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C. difficile epidemiology

- 3-5% of adults carry some *C. difficile*, increases during hospitalization
- Colonized people do not get disease
- Treatment of the patient with antibiotics or acid-reducing drugs predisposes the gut to *C. difficile* colonization
  - Antibiotics; fluoroquinolones, cephalosporins, clindamycin
  - Proton pump inhibitors, H_2 blockers
- *C. difficile colitis* is an iatrogenic disease; we help cause it by medical treatments

C. difficile infection diagnostic tests

- Three types of tests, one is starting to dominate
  - Cell-associated antigen (GDH) tells you if the organism is there, not the toxin
  - Toxin antigen tells you if one or both of the toxins are there
  - Amplified DNA tests tell you both the organism and the toxin and are most sensitive and specific

Photo courtesy of Cepheid

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C. difficile infection diagnostic tests

- All DNA amplification tests are done on stool from patients with diarrhea
- Test may remain positive for up to a month after cure; cannot use as a test for clearance or cure
- Are not quantitative; cannot use to monitor treatment response

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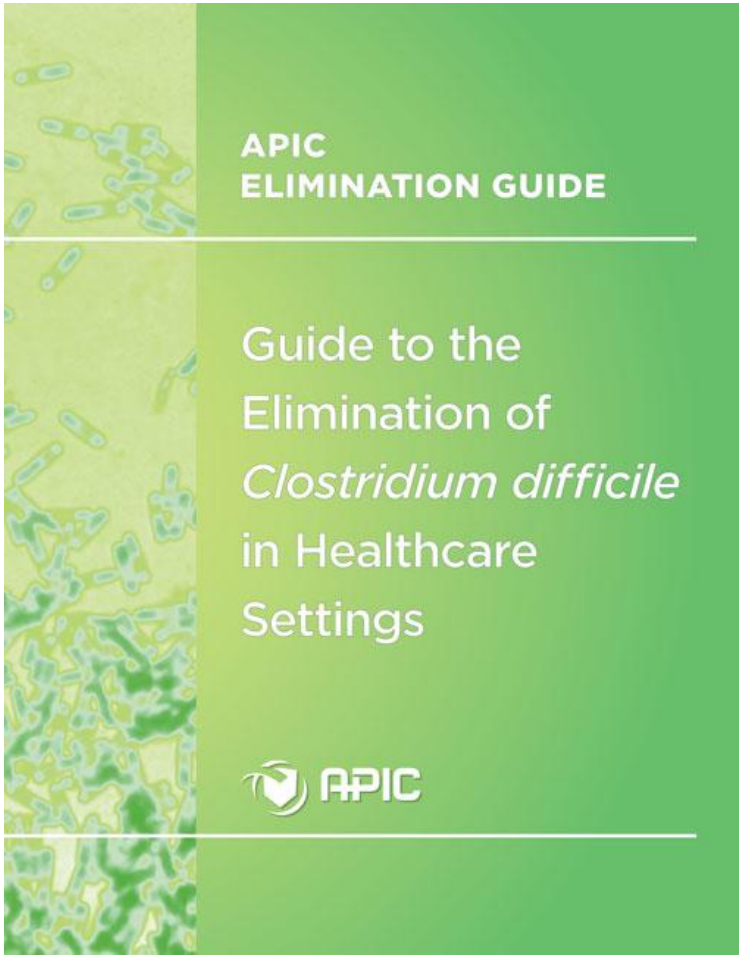
Preventing *C. difficile* infection; environmental cleaning

- Environmental cleaning is extremely important in the control and prevention of *C. difficile*
- Because the organism is found in the stool of the sick patient with diarrhea, the organism soon spreads to all areas and items of the room that are touched
- The organisms that are excreted are vegetative cells, not endospores, so routine disinfectants are adequate for routine cleaning, but **cleaning must be done very thoroughly**
- Endospores can stay viable in dust and dirt on floors and in bathrooms for months, but routine scrubbing will remove them

Preventing *C. difficile* infection; environmental cleaning

- "The use of bleach should be limited to outbreak situations as recommended by the CDC. Cleaning and disinfection activities using the physical motions of cleaning and use of the routine germicide removes and dilutes spore concentration and is acceptable in the absence of an outbreak."



Preventing *C. difficile* infection; hand hygiene

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Preventing *C. difficile* infection; hand hygiene

- *C. difficile* is an endospore-forming bacterium
- Alcohol does not kill endospores
- Neither does soap, but washing with water removes them
- Some say that we need to use soap for hand hygiene rather than alcohol to prevent the spread of *C. difficile*, but this is controversial
- The most important factor in the role of hand hygiene in controlling *C. difficile* is not the method, but in doing it
- Glove use is more important than hand hygiene products in the control of *C. difficile*

Preventing *C. difficile* infection; hand hygiene

For soap

- In vitro studies show a greater reduction in endospores on hands that have been inoculated with spores
- Hands may become contaminated with endospores
- Soap may reduce the risk of transmission in outbreak settings

For alcohol

- No studies support that it prevents or controls *C. difficile*
- Alcohol is superior for other MDROs
- Alcohol does kill vegetative cells
- The patient is excreting vegetative cells
- Alcohol is faster and staff are more compliant when they use it

Preventing *C. difficile* infection; hand hygiene

- "Preferential use of soap and water for hand hygiene after caring for a patient with CDI is not recommended in non-outbreak settings."

SUPPLEMENT ARTICLE: EXECUTIVE SUMMARY

A Compendium of Strategies to Prevent Healthcare-Associated Infections in Acute Care Hospitals

EXECUTIVE SUMMARY

Preventing *C. difficile* infection; special precautions

- Special precautions are very important in the control and prevention of *C. difficile*
  - Patient placement; early identification and placement in a private room
  - Personal Protective Equipment; gloves and gown
  - Patient Transport; new PPE at the destination, notify the destination of the contact precautions
  - Cleaning patient care equipment
  - Assessing adherence to special precautions

CDC Vital Signs recommendations

6 Steps to Prevention for Clinicians (released March 6, 2012)

1. Prescribe and use antibiotics carefully (about 50% of all antibiotics given are not needed, unnecessarily raising the risk of *C. difficile* infections)
2. Test for *C. difficile* when patients have diarrhea while on antibiotics or within several months of taking them
3. Isolate patients with *C. difficile* immediately

CDC Vital Signs recommendations

4. Wear gloves and gowns when treating patients with *C. difficile*, even during short visits (hand sanitizer does not kill *C. difficile* and hand washing may not be sufficient)
5. Clean room surfaces with bleach or another EPA-approved spore-killing disinfectant after a patient with *C. difficile* has been treated there
6. When a patient transfers, notify the new facility if the patient has a *C. difficile* infections

Conclusions

- *C. difficile* causes serious disease and its incidence, morbidity and mortality are increasing
- *C. difficile* disease is iatrogenic; caused by medical care; it is our responsibility to reduce it because we cause it
- There is no magic answer to *C. difficile*; focus on the basics but do them well
- Everyone must work together to reduce the risk of *C. difficile*
  - Doctors, nurses, environmental services, transport, family, visitors, the patients